CLAIMS

1. A method of designing low-density parity check codes, the method comprising the steps of:

creating a π-rotation parity check matrix having a first code rate; and

concatenating a first matrix to the π-rotation parity check matrix to increase the code rate.

2. The method of claim 1, further comprising the step of iteratively concatenating additional matrices to the concatenation of the first matrix and the π-rotation parity check matrix to further increase the code rate.

3. The method of claim 1, wherein the first matrix is formed by the steps of:

generating a plurality of available matrices;

encoding the matrices with information vectors of weights 1 and 2; and

discarding matrices with a low minimum distance.

4. The method of claim 3, wherein the first matrix is formed by the additional steps of:

calculating the approximate upper bound for matrices not discarded; and

selecting a small set of codes with advantageous characteristics under high signal to noise ratio.

5. The method of claim 4, wherein the advantageous characteristics comprise a lowest bound characteristic.

6. The method of claim 3, wherein the first matrix is formed by the additional steps of:

calculating girth distributions for the matrices; and

selecting one of the matrices with a minimum number of short cycles.

7. The method of claim 4, wherein the first matrix is formed by the additional steps of:

calculating girth distributions for the matrices; and

selecting one of the matrices with a minimum number of short cycles.

8. The method of claim 1, wherein the first matrix is formed by the steps of:

generating a plurality of available matrices; and

selecting the first matrix based on expansion properties of the first matrix.

9. The method of claim 8, wherein the step of selecting the first matrix based on expansion properties of the first matrix comprises:

generating a plurality of matrices having good minimum distance profiles;

expanding the matrices to create a set of expanded matrices for a predetermined range; and

selecting one of the matrices as the first matrix based on performance qualities of the corresponding expanded matrix.

10. The method of claim 9, further comprising determining an error probability of the expanded matrices for high signal to noise ratio.

11. A network element, comprising:

a processor,

at least one interface configured to engage in transmissions on a communication network; and;

control logic configured to create a parity check matrix for use by the interface to perform forward error correction on the transmissions on the communication network, the parity check matrix comprising a π-rotation parity check matrix having a first code rate; and a first matrix concatenated to the π-rotation parity check matrix to increase the code rate of the π-rotation parity check matrix.

12. The network element of claim 11, wherein the parity check matrix further comprises additional concatenations of additional matrices configured to further increase the code rate of the concatenation of the first matrix and the π-rotation parity check matrix.

13. The network element of claim 11, further comprising code generation software configured to generate the parity check code for use by the interface.

14. The network element of claim 11, wherein the interface is an antenna configured to perform one of transmission and reception of wireless signals on a wireless communication network.

15. The network element of claim 11, further comprising routing software to enable the network element to implement routing decisions on the communication network.